



Forest Insect & Disease Management

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SARATOGA SPITTLEBUG EVALUATION SURVEY

BALDWIN RANGER DISTRICT

MANISTEE NATIONAL FOREST

by

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INTRODUCTION

A Forest Pest Report (Form NE 5200-1) dated April 24, 1976 from the Baldwin Ranger District, Manistee National Forest stated that evidence of adult spittlebug feeding was found on planted red pine trees during surveillance in November, 1976. Damage was reported extensive at that time. On August 9, 1977, Robert P. Ford inspected the damaged plantation and another nearby red pine plantation which the foresters at Baldwin believed was infested. The objective of the inspections was to estimate the severity of this year's spittlebug damage.

TECHNICAL INFORMATION

Causal Agent - Saratoga spittlebug, Aphrophora saratogensis
(Fitch) Homoptera: Cercopidae.

Burn blight disease, Chilonectria cucurbitula (Curr.) Sae.
is associated.

Hosts - Red Pine, Pinus resinosa Ait.

Other conifers, particularly jack pine, Pinus banksiana Lamb. are attacked, but they were not present in the stands inspected.

Nymphs of the spittlebug feed on any of the herbs, shrubs, tree seedlings, and ferns that grow within the range of red pine. The most important of these is sweetfern, Comptonia peregrina Coult.

Type of Damage - Adult spittlebugs insert their mouthparts into the xylem of conifer branches, particularly one year old internodes, and suck the sap. A fluid injected by the bug, probably an enzyme, causes branch necrosis. The puncture by the mouthparts leaves a scar in the xylem. Resin infiltrates the scar, and surrounding tracheids are twisted out of shape so that the xylem does not conduct fluid in normal volume. Each scar blocks about 1 to 5 percent of the cross-sectional area of a twig; and each adult bug makes 2-5 punctures a day. Sap withdrawal causes minor damage because the tree can maintain the flow of nutrients at that time. When the tissues mature, water supply to the infested branch is reduced by the scars and sucrose content declines. Heavily attacked branches (30 or more/10 cm of length) turn brown and die the year following spittlebug feeding. Light attacks (13 or less scars/10 cm) may reduce branch length growth by 50-70 percent.

Drought, high temperature, and burn blight fungus that enters punctures can hasten the death of infested trees. When flagging (dead branches) is evident, it may be too late to apply a control measure. This is because of the one year lag between spittlebug feeding and symptom expression. The flagging usually appears after three consecutive years of heavy infestation. Perpetual light infestations cause mis-shaped trees with variable branch lengths.

Outbreak Location - The two red pine plantations examined were in T17 R15:

Plantation A, 30 acres, northeast portion of S31.

Plantation B, 20 acres, northwest portion of S29.
(Fig. 1).

Biological Data - Each plantation was surveyed separately according to the method outlined by Ryan¹. A survey for adult spittlebugs was not done because:

1. Such surveys are inaccurate (Ewan, 1961).
2. Only one adult was seen on August 9. About 75% of adults should have been active then (Ewan, 1961).

The Ryan method requires a systematic survey of 1/500-acre plots for the collection of scar-count twig samples, and for a count of trees/acre and average tree height. The maximum number of plots recommended by Ryan was used--one plot for each acre of plantation. Ewan (1961) recommended 13 samples in heavy spittlebug population stands and 109 samples where populations were light.

Plantation A, with 763 trees/acre and an average tree height of 9.6 feet, had a mean scar count of 13 scars/10 cm (4 inches) of branch.

Plantation B, with 812 trees/acre and an average tree height of 3.2 feet, had a mean scar count of 17 scars/10 cm (4 inches) of branch.

¹Ryan, S. O. Undated. Instructions for Saratoga spittlebug scar-count survey. Nicolet, Ottawa, Chequamegon National Forests. Mimeo. 9pp.

Only one sample, from Plantation B, had 30 scars.

According to Millers², a scar count divided by 10 then subtracted from 4, which is the maximum number of safe years, indicates what work should be done in the near future. By this formula, plantation A and B should be surveyed in 1979 for another scar-count. When the formula shows an index of 0-0.8, a nymphal survey is needed and a probable spray operation would follow.

There is no outward appearance of spittlebug damage to trees in plantation B. There is extensive tree mortality and flagging through the center of plantation A, and this usually means spraying will not save the trees. Spittlebug suppression should be done before trees have dead branches.

It may be that spittlebug feeding in 1974 and 1975 was heavy and, in some combination with drought in 1976, caused the tree mortality. Red pine around the sides of the plantation were not injured, and were growing at an average rate.

Environmental Factors - Cold, dry weather is a major control factor regulating adult spittlebug populations where hosts are present. If temperatures are less than 60°F, females don't lay eggs. If less than 50°F, adults will not feed or mate. Neither of these minimum temperatures persisted in the survey areas at the time adults were active.

Nymphs are very susceptible to hot, dry weather. If caught outside their foamy spittle mass when relative humidity is less than 30%, nymphs will die in 12 hours. However, they require sparse vegetative cover to survive. There is little likelihood of nymphs dying, except when they move from their eggs on the pine to the root collar of herbs. At this time they are exposed to drying, but they can locate suitable sites and begin making a protective cover in 30 minutes if the host is within 10 feet of the oviposition site.

Spittlebug damage creates an environment favorable to the insect because it creates openings for alternate host establishment and maintains a slow-growing pine stand. Trees over 15 feet tall are not often affected by spittlebug, so the sooner trees can reach that height and crown closure is achieved, the less favorable the environment becomes for spittlebug.

²Millers, I. 1969. Guidelines for Saratoga Spittlebug Control, NA, S&PF, St. Paul Field Office. 33pp. Unpublished.

DISCUSSION

It seems that the spittlebug population survived the drought of 1976; but the trees in plantation A, weakened by spittlebug attack, were adversely affected.

The stands are still of susceptible height, and there is an abundance of alternate host. The stands will probably be susceptible to attack again in 1978, although there is not a reliable method for predicting this. Egg sampling is not a good indicator of scar formation the following year.

Parasites and predators are still an unknown factor (Ewan, 1961). There may be a 3-5 percent parasitism of eggs, but other parasites arrive too late in the course of the outbreak to save trees (Ewan 1961).

An experiment to reduce populations of spittlebug by killing alternate host was done in Maine (Linnane, 1976). Two applications of 2,4-D were needed where sweetfern was abundant. Spittlebug nymphal populations were reduced the second year after treatment, but were unaffected the first year. The method was not tested in Michigan, but should be considered as an alternative to the use of malathion against adult spittlebugs where timing of application is critical.

RECOMMENDATIONS

1. Forest Insect and Disease Management personnel should make another scar-count survey of both plantations in 1979. Although there is some tree mortality and flagging as the result of spittlebug feeding, burn blight, and drought, populations of spittlebugs seem to be decreasing. A nymphal survey and suppression project is not required now according to the number of scars (13 and 17) found in this survey. When the scar-count is about 30 and Millers' index is 0-0.8, a nymphal survey and a suppression project is biologically necessary.
2. District personnel should locate additional nearby red pine plantations that are between 5 and 15 feet tall so that an entomologist can survey all susceptible stands in 1979.

LITERATURE CITED

- Ewan, H. G. 1961. The Saratoga spittlebug. Lake States For. Exp. Sta., Tech. Bull. 1250.
- Linnane, J. P. and E. A. Osgood 1976. Controlling the Saratoga spittlebug in young red pine plantations by removal of alternate hosts. U. of Me Life Sci. and Agr. Exp. Sta., Tech. Bull. 84.

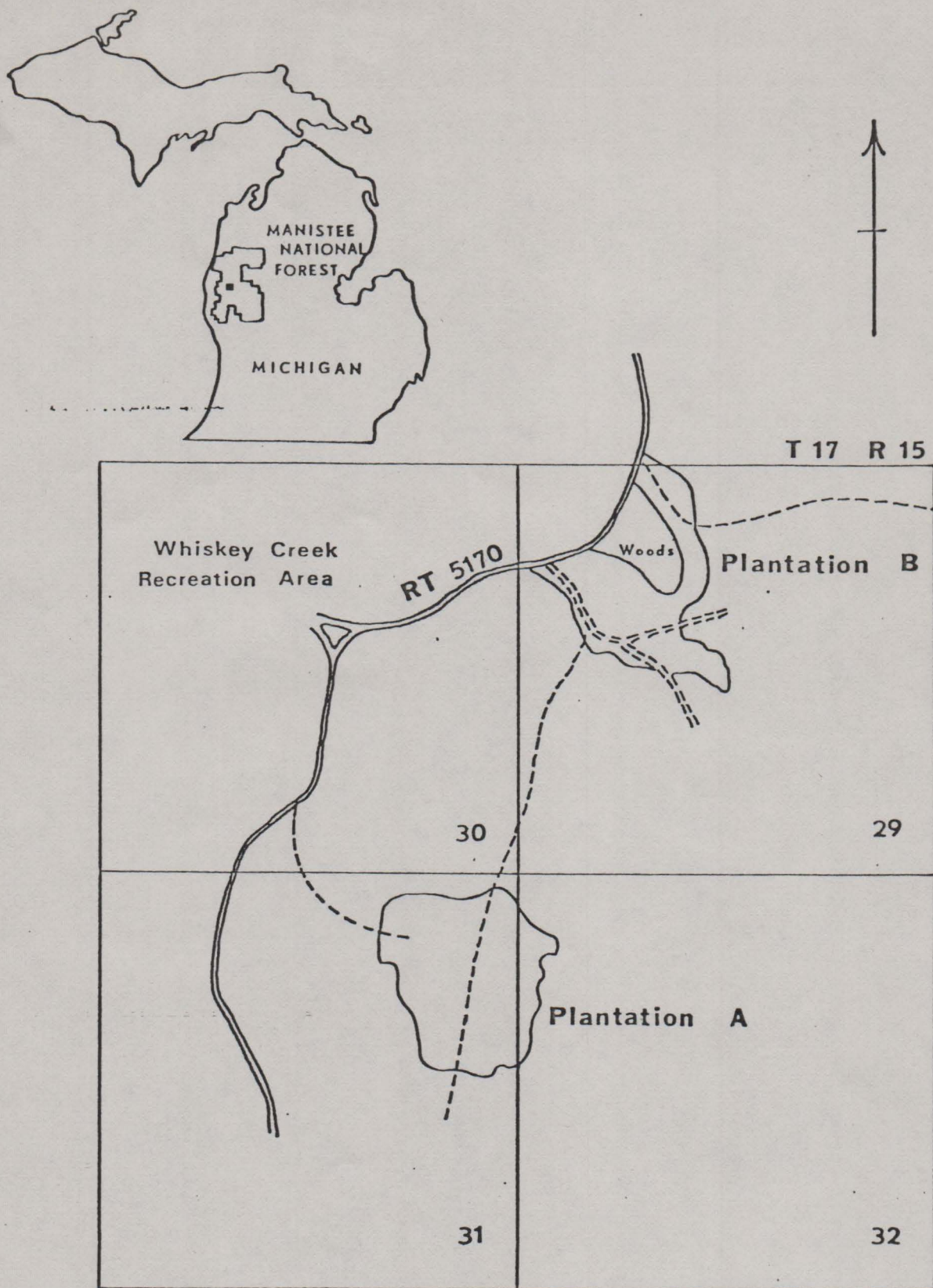


Figure 1. -- Location of Saratoga spittlebug infestations, 1977.